Time-related Lethal Blood Concentrations from Acute Human Poisoning of Chemicals. Part 2: The Monographs

No. 46
Oxalate

Balcarras Crafoord and Björn Ekwall

CTLU, Pavals, När, SE-62013 Stånga, Sweden
Tel. +46 498 492259, Fax. + 46 498 492445,
E-mail: bjoern.ekwall@ctlu.se
Website: http://www.ctlu.se

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Please, provide CTLU with supplementary unpublished and published case reports with time-related blood concentrations, for inclusion in forthcoming revisions of monographs.

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The outcome of our effort to compile time-related blood concentrations will ultimately depend on the generosity of poison information centres, emergency clinics and medicolegal institutes to provide supplementary, unpublished case reports. We are very grateful for the case reports submitted already to this first edition from the contributing centres listed below.

Contributing Centres

BGPC - Centre Antipoisons/Antigifcentrum, Brussels, Belgium
FPPC - Paris Poisons Centre, Hôpital Fernand Widal, Paris, France
IPC - Irish Poison Information Centre, Dublin, Ireland
IUBMD - Medicolegal Institute, Home Police Department, Bhopal, India
MEMTD - Dept. Pharm/Tox., Univ. Autónoma Nuevo León, Monterrey, Mexico
NPC - Dutch National Poisons Control Centre, Bilthoven, The Netherlands
RTC - Russian Toxicology Information and Advisory Center, Moscow, Russia
SPC - Swedish Poison Information Centre, Karolinska Hospital, Stockholm
SWPC - Swiss Toxicological Information Service, Zürich, Switzerland

Introduction

This and the other monographs in this series have been prepared as an methodological aid in clinical toxicology and forensic medicine. The main purpose has been to improve the standard knowledge of lethal concentrations of common chemicals, by introducing time-related concentrations. Our intention is to revise these monographs periodically. In the present shape many of the monographs may not be especially helpful, but with time we hope to provide effective tools to judge blood concentrations measured at various time intervals.

The monograph tabulates time-related toxic sublethal blood concentrations (Table 1) as well as lethal blood concentrations (Tables 2 and 3A) from acute

human poisoning cases. Also other data from the case reports are presented, such as age, sex, symptoms and treatments. The case reports have either been collected from the literature or have been contributed to the study from other institutes. Concentrations in living persons as well as post-mortem concentrations are presented. As a by-product of the search for time-related concentrations, a few sublethal and lethal blood concentrations are also presented in Tables 3B and 4. Statistics on average concentrations are found in Table 5.

In Figure 1A the sublethal blood concentrations are plotted versus time, which allows an LC_{100} curve to be drawn, suggesting an upper limit for survival. In Figure 1B the lethal concentrations are plotted versus time, leading to an LC_0 curve, suggestive of a lower limit for lethality. An LC_{50} curve could most often be calculated in Figure 1B as the average of the LC_{100} and LC_0 curves. Average handbook data on clinical and forensic lethal concentrations were included in Figure 1B, for comparison with the case report data. Also, short comments to the LC_{50} curve have been made.

Note that it is quite necessary to have access to **B. Ekwall and B. Ekwall, Time-related Lethal Blood Concentrations from Acute Human Poisoning of Chemicals. Part I: General Introduction**, to be able to interpret the contents of the present monograph (aims of the monograph, principles of data selection and presentation, abbreviation list, standard toxicological data, etc.).

Pavals, När, June 27, 1998

Björn Ekwall & Barbro Ekwall

Editors

46. Oxalate

MW= 88

Table 1. Time-related human, sublethal blood concentrations and symptoms from single-dose, acute poisoning

Literature reference	Case	Ingested dose		Method of analysis	Time	Blood concentration		Time	Symptoms and signs	Treatment	Time
Author(s)/year	Age M/F				exp./ sample			exp./ arrival at ER	NB. h is hours after admission ba = before admission l = later on	NB. h is hours after admission	exp./ rec.
		I/U A/Z			h	mg/l	µM	h			h
Zarembski 1967	49F	I A	N R(a)	F M E	6	3,7	42,0	0	N R	N R	N R

(a) potassium hydrogen oxalate

Table 2. Time-related, clinically monitored human lethal blood conc. and symptoms from single-dose, acute poisoning

Literature reference	Case	Ingested dose		Method of analysis	Time	Blood concentration		Time	Symptoms and signs	Treatment	Time
Author(s)/year	Age M/F				exp./ sample			exp./ arrival at ER	NB. h is hours after admission ba = before admission l = later on	NB. h is hours after admission	exp./ death
		I/U A/Z			h	mg/l	µM	h			h
Zarembski 1967	20F	I A	N R(a)	F M E	6	109,5	1244	N R	N R	N R	N R

(a) potassium hydrogen oxalate

Table 3. Post-mortem human blood concentrations and symptoms from single-dose, acute poisoning

Literature reference	Case	Ingested dose		Method of analysis	Time	Blood concentration		Time	Symptoms and signs	Treatment	Time
Author(s)/year	Age M/F				death/ autopsy			exp./ arrival at ER	NB. h is hours after admission ba=before admission l = later	NB. h is hours after admission	exp./ death
		I/U A/Z			h	mg/l	µM	h			h
A. Cases with time related blood concentrations											
None											
B. Cases without time information											
AAPCC 1987:37	24F	I A	N R(a)	N R	N R	2	22,7	N R	G,V,SZ I:LP,MS,PE	ST	N R(b)
Zarembski 1967	43F	I A	N R(c)	F M	N R(d)	18	204,5	N R	N R	N R	N R
	63F	I A	N R(c)	F M	N R(d)	77,2	877,1	N R	N R	N R	N R

(a) oxalic acid (b) died of a massive gastrointestinal bleed >6h after ingestion (c) potassium hydrogen oxalate (d) 1-3 days after death

Table 4: Acute, clinical sublethal and lethal blood concentrations, without time information

Literature reference	Case	Ingested dose	Method of analysis	Time	Blood concentration		Time	Symptoms and signs	Treatment	Time
Author(s)/year	Age M/F	I/U A/Z		exp./ sample h	mg/l	µM	exp./ arrival at ER h	NB. h is hours after admission ba = before admission l = later on	NB. h is hours after admission	exp./ rec or death
A. Sublethal blood concentrations										
None										
B. Lethal blood concentrations										
None										

Table 5: Average blood concentrations

	No of cases	Average time h	Average blood concentration mg/l	µM	Average time exp./ rec. or death h
Time-related sublethal blood concentrations	1	6	3,7	42,0	
Time-related, clinically monitored lethal blood conc.	1	6	110	1244	
Time-related post-mortem blood concentrations	None				
Sublethal blood conc. without time	3		32,3	367	
Clinically monitored lethal blood conc. without time	None				
Post-mortem blood conc. without time information	None				

Oxalate blood concentrations

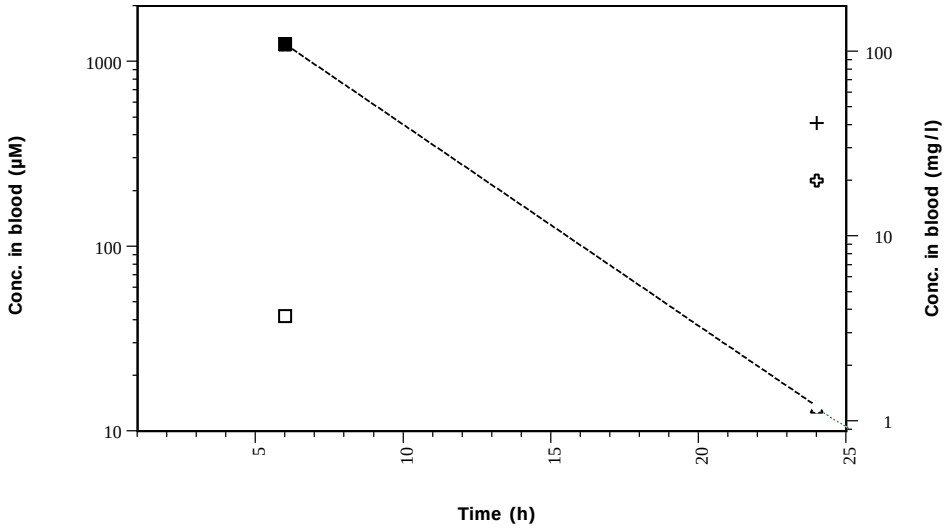
Most described cases of oxalic acid poisoning have occurred in children, usually after ingestion of various parts of oxalate-containing plants. One example is rhubarb leaves, but it must be noted that rhubarb contains toxic substances other than oxalate. However, a few cases of poisoning in adults have been described (Zarembski 1967). Based on one Zarembski case, an arbitrary first order LC_0 curve has been drawn in Figure 1, with a peak concentration of 110 mg/L. The handbook lethal concentrations are lower, corresponding to 10-13h values of the LC_{50} curve.

References

Table 1-2 (clinical cases)

Zarembski, P.M., Hodgkinson, A. (1967) Plasma oxalic acid and calcium levels in oxalate poisoning. J. Clin. Path. 20, 283-285.

Figure 1. Cases with sublethal and lethal concentrations of Oxalate



□ One sublethal value

■ One lethal value

----△---- LC_0

\+ Average lethal conc. from 8 forensic medicine lists (n=3)

✣ Average lethal conc. from 11 clinical toxicology handbooks (n=3)

Time to peak conc: 6h

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